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FINDS LIFE TRACES IN OLDEST ROCKS

Proof that life existed on the earth when the oldest of known rocks were formed is claimed by Dr. John W. Gruner, of the geology department of the University of Minnesota. He has shown traces of blue-green algae, very primitive microscopic plants, to be present in rocks of the age known to geologists as Archaean, which have hitherto been thought to be devoid of all fossil remains. In the past, indeed, many geologists believed that most of the Archaean rocks were formed by direct cooling of a molten earth, which would, of course, have meant a temperature too high for the existence of any life.

The rocks in which the new life traces were discovered have in the course of ages been subjected to immense pressures, partial solutions, and recrystallization processes, to such an extent that the exact nature of the plant remains cannot be stated with certainty; but botanists at the University have no doubt that they were some kind of algae. If they were algae of the blue-green type, there is still a possibility that they may have existed in a very warm environment, for plants of this kind still live in the nearly boiling natural waters of Yellowstone Park and other hot springs regions; though blue-green algae are also common in water of ordinary temperatures.

Because of the fact that most of the oldest fossils hitherto known, from rocks much younger than the Archaean, were of animals and plants relatively high in the evolutionary scale, biologists and geologists have long predicted on theoretical grounds that simpler remains would some day be found in older formations. Dr. Gruner's find is therefore looked upon as an interesting confirmation of this scientific prophecy. And inasmuch as blue-green algae were among the plants whose probable early existence was looked for, the fulfillment is regarded as the more accurate.

Other organic remains of almost equal age have been found in rocks of the Algonkian and Huronian periods by Dr. Charles D. Walcott, secretary of the Smithsonian Institution of Washington. In these rocks, which belong to the geological times immediately following the Archaean, Dr. Walcott has demonstrated the existence of blue-green algae and bacteria; but here, as also in the Archaean, no sure sign of animal life has yet been found. Animal fossils appear for the first time in the Cambrian, which followed these three earliest geological epochs.

ELECTRIFYING THE SKIN

By Dr. Edwin E. Slosson

When sunlight strikes the bare skin it knocks out an electron from one of the atoms on the surface. This discovery was announced before the French Academy of Sciences on March 2 by Jean Saidman.

He stood a man on a stool insulated from the ground by legs of glass or rubber and gave him a certain charge of negative electricity, which of course is altogether imperceptible to the person experimented upon. The electricity leaked away gradually and in 250 seconds three-quarters of it had disappeared. Then he turned a ray of ultra-violet light from a mercury lamp twenty inches distant upon a section of the exposed skin less than two inches square and found that the electricity leaked away four times as fast. Three-fourths of the original negative charge was gone in 64 seconds instead of 250. When a larger area of the skin was irradiated the loss of electricity was more rapid. Sunshine produced the same effect, though more slowly because the light of the sun is not rich in the energetic rays beyond the violet end of the spectrum. The leakage of electricity continues for some seconds after the light is shut off, probably being carried away by ionised particles of air and dust.

It has been known for some years that when a metallic surface, such as a polished plate of silver or copper or a fresh cut face of sodium or potassium, is exposed to ultra-violet rays it loses negative electricity. This is due to the detachment of the corpuscles of negative electricity, known as "electrons", which revolve in the outer orbits of an atom about the central and positive nucleus. This action of light on electricity is called the "photo-electric effect". It is this photo-electric effect that causes the photographic plate to record the image which the light casts upon it. It is this that activates the green leaf to store up food by aid of energy of the sun's rays.

The human skin is found to be one third as sensitive to the photo-electric effect as a sheet of copper, and we may find in this an explanation of the mystery of the curative effects of sunshine on the skin. The ultra-violet rays have a wave-length too short to be perceived as light by the eye, and they are unable to penetrate the clothing or the skin because they are so easily absorbed. Even a microbe, so small as to be barely visible in a microscope, is too thick for these short waves to pass through. So if one microbe is lying on top of another, when exposed to these rays, the top one will be killed by them while the lower one, being sheltered by the body of his mate, will escape injury.

Yet the ultra-violet rays of bright sunlight, or the stronger rays produced by the mercury quartz lamp, will not only tan or burn the skin but have a profound effect upon the deeper tissues; changing the composition of the blood, stimulating it to greater activity against disease germs and often curing sores and bone diseases. This is to say, these short and easily deterred waves which can act only on the outer surface of the skin produce more profound effects upon the whole system than the longer waves of red light and heat which readily penetrate the skin and even pass through the entire body. M. Saidman suggests that the influence of the ultra-violet rays is exerted through the photo-electric effect on the surface which is transmitted from layer to layer into the interior of the body.

The use of violet and ultra-violet and radium rays in this country is becoming a fad that seems likely to rival the famous blue glass craze of the seventies.

All sorts of ray apparatus and preparations are now finding a ready sale for the cure of all manner of ailments, but it may be said of most of them that they are either too weak to be of any use whatever or too strong to be used indiscriminately and unintelligently. It requires a specialist and expert to employ powerful rays of this kind for they may produce very serious effects at the time or much later. Those who want to experiment for themselves in this fascinating field of radio-therapy should stick to oldest source of such rays, the sun. It will be cheaper for them and they will run a risk of nothing worse than a sunburn.

RADIO MOVIES HERE INVENTOR ANNOUNCES

Motion pictures have already been successfully sent and received by radio, C. Francis Jenkins, Washington inventor, declared before the American Chemical Society meeting at Baltimore. Describing the laboratory experiments in which this seeming marvel is daily performed, he predicted that stay-at-homes throughout the country will see the next presidential inaugural ceremonies and the Olympic games without leaving their own firesides.

Distant baseball games, boat races, and baby parades will be visible to radio fans operating receiving sets at home, he said.

Still pictures are now excellently done both by radio and wire, he explained, and the only difference between stills and movies is a matter of speeding up the apparatus. The process is very simple and much like that with which our mothers used to entertain the youngsters when she laid a piece of white paper over a penny and rubbed over it with a dull pencil until the Indian's picture appeared on the paper.

By means of turning glass disks with prismatic edges a tiny pencil or point of light is made to travel across a photographic plate in a succession of parallel adjacent lines. The picture is formed by constant changes in the strength of the light which is controlled by the varying strength of the incoming radio signals.

By speeding up the disks and other apparatus, the inventor declared he had succeeded in sending motion pictures from one room of his laboratory to another and the practicability of sending at great distances has been demonstrated.

JAPANESE CHEMIST TELLS HOW HE MADE GOLD FROM MERCURY

The artificial production of gold from mercury by the application of strong electrical forces is announced by Prof. Hantaro Nagaoka of the Institute of Physical and Chemical Research, Tokyo.

Such a transmutation was recently reported by Prof. A. Miethe of Berlin, but the Japanese chemist used a different method. Miethe worked with an electric field as small as 170 volts per centimeter but Nagaoka employed many million volts and by a special device concentrated it upon a narrow space in the immediate neighborhood of the surface of the mercury.

In a statement made to Science Service, Prof. Nagaoka says:

"Although the yield is small, and can only be examined with a microscope of low magnifying power, mercury is transmuted into gold. After a few more experiments as to the best laboratory arrangement, the method will be made public. So far as the experiment goes, gold comes out in colloidal state and forms beautiful ruby glass. On evaporating the treated mercury, gold is deposited on the bottom of the vacuum distilling apparatus in a very thin film, which viewed with nearly normal reflected light shows the characteristic yellow color, and seen with transmitted light the complementary greenish tint. It stands the usual Cassius purple test for gold."

"It was only in an extremely intense electric field that the experiment succeeded. In order to be sure of transmutation, repeated purification of mercury by distilling in vacuum at temperatures below 200 degrees Centigrade is essential."

"Finally, I wish to state that there are many Tokyo papers and journals giving mistaken notions of the experiment, so that translations of different statements are not in the least to be trusted."

The object of these researches is not the production of gold in commercial quantities but the study of the internal structure of atoms. From an investigation of the fine structure of the lines of the mercury spectrum, published in No. 13 of the Scientific Papers of the Institute, Dr. Nagaoka came to the conclusion that the nucleus of the mercury atom consisted of compact central mass with a proton particle elastically connected with it. If this proton could be detached from the mercury atom by some sufficiently powerful force the remaining nucleus would have the same positive charge as that of gold, and a similar arrangement of electrons. The spectroscope verified this surmise and the next step was to construct apparatus that would expel the proton from the mercury nucleus and thus effect the transmutation of the element into gold which he now reports accomplished. Since proton is the nucleus of a hydrogen atom the result may be roughly expressed by saying that by knocking out a hydrogen atom some of the mercury atoms are reduced to gold atoms.

OCEAN WAVES YIELD TREASURE

Commercial methods of working the sea for treasure are being developed, and the tiny proportions of valuable materials in sea water may soon be a big item in the world's resources, chemists believe.

The expedition of the steamship Ethyl, which is to cruise in mid-ocean taking in millions of gallons of water and extracting 50 tons of bromine in a month, indicates that the vast ocean territory can be practically "mined". There are 86,800,000,000,000 tons of bromine in the ocean. The world's normal output of bromine has been less than 2,000 tons a year, of which America produces 900 tons. The American bromine has been produced chiefly from brine wells in Michigan and Ohio.

But American chemists have devised a method of extracting the pound of bromine hidden in 30 tons of sea water without the necessity of evaporating this huge amount of water. As a result the S.S. Ethyl has been made into floating chemical factory and will be sent out to operate far from the shore away from sand and other floating impurities.

The United States' output of bromine has been considered at ^a/maximum, but it has still been insufficient to meet the large demands resulting mainly from our own increasing consumption in the manufacture of tetraethyl lead, the fluid used as an anti-knock addition to gasoline. Prices of sodium and potassium bromides have more than doubled since January, 1924, due to the increasing need for bromine in medicine, photography, the moving picture industry, and in production of the ethyl fluid of motor fuel.

Although bromine is not present in the ethyl anti-knock solution as actually used in motor fuel, it plays an important part in its manufacture by entering into chemical combination with the ethyl portion of the compound. Most of the bromine is used over and over again, but the Ethyl Gasoline Corporation in view of the shortage of the chemical found it necessary to develop a new source of supply.

Of the 35 parts of solid matter contained in 1,000 parts of average sea water, about two-tenths of one per cent. is magnesium bromide. The percentage of bromine itself in the water is only about seven thousandths of one per cent. Sea water contains 32 of the 92 known elements, all of which are supposed to have been washed into the ocean by fresh water streams that leach the soluble constituents from the soil.

The small quantities of gold in sea water have attracted chemists for many years and Prof. Fritz Haber, famous German chemist, is the latest scientist to work seriously on a process for its extraction.

----- NEW ANESTHETIC GAS DISCOVERED

Propylene, a gas closely related to ethylene, whose usefulness as an anesthetic was one of the sensational medical discoveries of the past year, has been found to possess similar powers, of such high quality that it may rival or even supplant its sister compound. Its properties were described before the meeting of the American Chemical Society by Dr. Lloyd K. Riggs and Harold D. Goulden, of the research laboratories of E. R. Squibb and Sons, at New Brunswick, New Jersey.

In the course of the experiments, in which large numbers of rats were used, it was found that a mixture of 76 per cent. of propylene with 25 per cent. oxygen and 8 per cent. nitrogen rendered the animals insensitive to pain in one minute and caused them to relax into complete unconsciousness in two. Used too long, propylene is poisonous, but there is a wide margin of safety, for about sixteen minutes' time was required before the rats' respiration failed, under the conditions of the experiment.

No long-range ill effects were observed to follow the use of the gas. A number of female rats were experimented with specifically on this point; and although they were used day after day in the tests they remained in good health, gained weight rapidly, and bore litters of normal young. As a consequence of their experiments, the investigators recommend the clinical use of propylene.

Propylene, like ethylene, is an ingredient of common illuminating gas, and is also obtained as a by-product in petroleum refining.

CHEMISTS PLAN POISON WARFARE AGAINST DISEASE BACTERIA

Plans for a systematic campaign against the minutest and most dangerous enemies of mankind were recently developed in the Division of Medicinal Products of the American Chemical Society meeting at Baltimore. For the first time in the history of the healing art, chemists are cooperating with bacteriologists and physicians in the effort to make compounds that will be harmless to the human body and yet will poison or paralyze the noxious plant and animal parasites that prey upon it.

New tactics are being employed in this campaign. Prof. Treat B. Johnson of Yale in opening the symposium on Chemistry in the Field of Microbiology advanced the novel idea that the first step was to find out what the microbes were made of in order to find a drug that would kill them. He is accordingly engaged in growing tubercle bacilli by the pound and then analyzing the, and he has already discovered in these microscopic creatures a nitrogen compound hitherto unknown to biologists.

Dr. Carl Voegtlin of the Hygienic Laboratory of the U. S. Public Health Service is working on organic compounds containing arsenic in order to discover one that will penetrate the human tissue in pursuit of the parasite more freely than the earlier arsenicals introduced by the late Professor Ehrlich of Germany. He reports that it is possible to produce a peculiarly active form of arsenic that will attack the mechanism by which the microbes breathe.

Dr. John W. Churchman of the Loomis Laboratory, New York City, finds that certain of the aniline dyes will attack and paralyze particular species of bacteria so they can be used as antiseptics, both for skin wounds and internal infection. Solutions of these dyes strong enough to check infection may be left in cavities, such as the joints, since they are too weak to damage the tissues. He thinks it not improbable that we shall soon be able to combat many cases of blood poisoning successfully.

Dr. Veader Leonard of Johns Hopkins has made a new antiseptic that promise to be of great value. It is a derivative of the familiar coal-tar compound resorcinol, and is called, "hexyl-resorcinol". This is more than 15,000 per cent. stronger as a germicide than the mother substance, resorcinol, yet is probably less poisonous. The new compound is excreted through the urinary tract so is likely to serve as a cure for infections of this region.

Prof. George W. Raiziss of the University of Pennsylvania has prepared chemically and investigated biologically a number of new dyestuffs containing mercury and has found two which are so much less toxic than the common mercury bichloride that they may be injected directly into the blood. In tests on rabbits they were found to be as curative against blood infections as mercurochrome, which is one of the recent products of such research.

The discovery of mercurochrome, meroxyl, and similar antiseptics was no lucky accident but the result of the systematic investigations that have been carried on at the Brady Urological Institute of Johns Hopkins Hospital for the last eight years. Dr. Hugh H. Young, director of the Institute, reported that in the progress of these investigations 265 dyestuffs had been studied and tested for their power of destroying germs and several drugs had been found among them that are useful as remedies or local or general infection.

NEW DEVICE RECLAIMS USED MOTOR OIL

No longer will motorists need to discard the oil from their crankcases and buy a fresh supply regularly if a new apparatus for reclaiming it developed at the Research Laboratory of the General Electric Company comes into wide use. Three years of experimentation by Charles Van Brunt and P. Schuyler Miller have at last culminated in success, and it is expected that the new apparatus will soon be in commercial use, as it has already proved its practicability.

When in ordinary use the oil in an automobile collects all sorts of impurities, such as road dust, products from the combustion of the gasoline, and many other substances which diminish the oil's efficiency, but if they can be removed the oil is as good as ever. In fact it is better than when it was fresh, because the most easily decomposed components are broken down when the oil is first used and are removed by the reclaiming process.

The method involves two steps, first the oil is clarified by shaking with a small amount of water glass and other chemicals, and then it is allowed to pass in a thin film over a heated plate. A continuous reclaimer has been developed which has a capacity of nine gallons a day and with its use the oil for 30 machines, each with a capacity of five quarts, can be kept in use indefinitely. One of the inventors has used the same oil in two different cars for three years, travelling during that time a total of 16,000 miles. The oil is still in use and promises to remain so indefinitely.

Several other investigators have reported success in reclaiming old automobile oil by other processes within the past few months and commercial utilization of these advances in chemistry is predicted.

FAINT STAR MAY BE SOLAR COMPANION

What may be a genuine companion to the sun has been discovered in the constellation of Taurus, the Bull, according to a study by Dr. W. J. Luyten of the Harvard College Observatory. The star, which is known as 46 Tauri, and just barely visible to the unaided eye, has been observed at the Lick Observatory in California, and the Dominion Astrophysical Observatory at Victoria, B.C. It is approaching the sun at a speed of about half a kilometer per second, which is a very slow velocity, astronomically speaking. As its motion across the sky is also relatively slight it is believed to be moving through space with the sun.

INSECT POISONS PRESENT PROBLEMS IN ELECTRICITY

Government research workers seeking for the best poisons to use against the cotton boll weevil of the south, the alfalfa weevil of the west, and others of the horde of insect pests everywhere, have found themselves confronted with some pretty problems in electrical physics. The Bureau of Entomology and the Bureau of Standards are now cooperating in an endeavor to find cheaper and more effective methods for insect warfare by solving some of them.

The antics of the minute particles in the dry poison dusts that are used against the boll weevil and other pests furnish a very interesting electrical puzzle. Some time ago it was found that a fine dry dust of calcium arsenate or other poison would stick to leaves just about as well as a liquid spray. It was cheaper to apply the poisons in this way, and for some purposes more effective as well. But

poison dusts have been found to vary considerably in the thoroughness with which they cover the leaves, and also in the length of time they will stick before being blown or washed off.

It has been suggested that static electricity is at the bottom of this behavior. As the microscopic particles of the poison dust, some of which are as small as five microns or one five thousandth of an inch, in diameter, swirl through the nozzle of the spray gun that friction apparently gives them an electrical charge. "Like charges repel; unlike attract," says the old rule. If the particles receive similar charges each one will push its neighbor away and "flock by itself". This will result in an even distribution of the poison dust over the plants, so that each weevil will have a chance to get the fatal mouthful he is entitled to. But if the particles receive mixed charges the opposites will attract each other, and little clumps of ten or a hundred of them will form, resulting in an uneven distribution. Obviously, the desirable thing is to devise apparatus that will give a uniform charge to the particles, and thus get thorough distribution of the poison at lower cost.

Another suggestion is that the natural electrical charge of the earth, which extends into the plants as into a sort of antennae attracts and holds the particles, if they happen to bear an electrical charge of opposite sign. However, Bureau of Standards scientists, while they admit the possibility of this phenomenon, are not inclined to make much of its importance.

The behavior of the minute droplets of liquid sprays also is controlled by electrical charges, but in a somewhat different manner, a Bureau of Standards official stated. The liquid drop acquires its charge by the chemical action of the dissolved arsenic compound rather than friction, and is attracted by small electrical charges in the living parts of the plant itself.

ELECTRIC LIGHTS START MINE EXPLOSIONS, RESEARCH SHOWS

Electric mine lamps may cause gas explosions just as readily as a match or other source of ignition according to tests just reported by the U. S. Bureau of Mines. These tests were made to determine whether the Bureau had been taking unnecessary precautions in requiring a special design for electric lamps to be used in mines where explosive gas was known to exist.

The present study conclusively settles the question. It has clearly been proven that the methane which is found in such gassy mines can be set off by electric lamps if the little bulb is broken. Hence the Bureau is reassured in its insistence that all precautions of construction now required for such lamps must be maintained. These precautions include the requirement that the lamp shall go out immediately if the bulb is broken. Thus the cause of ignition disappears at once when an accident damages the lamp so that the hot filament might be exposed.

The developed water power of the world has increased 26 per cent. in three years, from 23,000,000 horsepower in 1920 to 29,000,000 horsepower in 1923, according to estimates by the U. S. Department of the Interior.

CHEMISTS SEE MONIERS OF INVISIBLE LIGHT

With literally gleaming eyes, a large audience of members of the American Chemical Society meeting at Baltimore saw and heard Prof. R. W. Wood of Johns Hopkins University, demonstrate some of the strange effects of invisible light. Eyes, teeth, finger nails, and shirt buttons of the audience glowed with a pale, phosphorescent light when the illumination of the theater in which the meeting was held was extinguished and a powerful mercury arc light, rich in the invisible ultra-violet rays, but visible only as a faint purple, was directed toward the assemblage.

This phosphorescence of various substances under the ultra-violet rays has already found application on the stage, Dr. Wood said, for by dressing the actors in costumes of material readily affected, they seem to glow. Scenery so treated has also been employed, and by mixing various visible colors with ultra-violet, the same background may be made to appear vastly different.

Dr. Wood revealed that ultra-violet rays were used secretly during the war for invisible signalling at night. The rays were focussed and directed in the same manner as ordinary light in a searchlight, but the invisible light could only be detected through the use of the proper detecting apparatus.

Ultra-violet rays are like those of ordinary light, Dr. Wood explained, except that the waves of which they consist are shorter than those of violet light, the shortest that we can see. Red light is the longest of the visible rays, and beyond them are the infra-red, also invisible but with very different properties from the ultra-violet. They do not have the power of inducing phosphorescence, but they do have the peculiar property of passing through mist and water vapor, a property used to advantage last summer in making photographs of Mars when it approached close to the earth.

Photographs were made of Mars with filters which transmitted only the infra-red rays, the chemists were told, and it was found that details on the surface of the planet were brought out which were quite invisible in pictures made with visible and with ultra-violet light. Further, the diameter of the planet in the infra-red pictures is appreciably less than in the others, so that astronomers have concluded that the presence of an atmosphere is indicated. These experiments were similar to some made several years ago by Dr. Wood, when he photographed the moon in a similar way.

AMERICAN ANIMALS' ANCESTORS FOUND IN INTERIOR ASIA

Fossils from Mongolia, discovered by the expedition of the American Museum of Natural History, indicate an Asiatic ancestry of certain American animals, Dr. W. D. Matthew, curator of the department of vertebrate paleontology, said in an address at the meeting of the American Society of Mammalogists at Washington. Tapirs, mammoths, rhinoceroses, and many smaller animals were found in the various geological strata. Dr. Matthew concludes from the evidence thus far developed that the ancestors of the cloven-footed mammals found in America originated in Asia. He believes, however, that the horse and dog families originated in America. No early human remains were found in Mongolia by the expedition.

CARLSBAD CAVERNS HAVE LARGE ANIMAL POPULATION

The famous Carlsbad caverns of New Mexico shelter a large and interesting population of animals, which was described before the meeting of the American Society of Mammalogists by Vernon Bailey of the U. S. Biological Survey, who made a study of them in connection with the recent exploration expedition of the National Geographic Society.

In these great caves, and in smaller ones near by, Dr. Bailey found large numbers of bats, together with cave mice, water rats, and a rare Mexican animal related to the raccoon, known as the ring-tail. Three species of skunks occupied some of the smaller caves, while gray foxes, bob-cats and mountain lions visited them less frequently. One open cave was used by mountain sheep as a refuge from the weather and from their enemies.

Mr. Bailey said that he wished to correct a misimpression that has gained considerable circulation, regarding the cave mice. These animals, he said, are neither white nor blind, though they do stay in the caves throughout their lives. The farmer's wife with the carving knife would have no luck with their tails; the mice would see her coming.

Most of the animals leave the caves for their feeding, but there are some that live underground all the time. The most characteristic species of the population maintain an interesting chain of life. A mould-like fungus is common in the caverns, growing upon the guano deposited by bats and on general organic debris washed in by water. Swarms of cave crickets feed on this fungus. The cave mice prey upon the crickets, and are in their turn preyed upon by the ring-tails. When a ring-tail dies, he eventually furnishes food for the fungus, and the cycle starts again.

TUBERCULOSIS DEATHRATE LOW THIS YEAR

The year 1925 has begun with a favorable tuberculosis record, according to statistics for the months of January and February, announced by Louis I. Dublin, statistician for the Metropolitan Life Insurance Company. If the developments of the remaining ten months of the year keep pace, there will be a remarkable reduction in tuberculosis mortality. February is a month for which one of the highest deathrates of the year from this disease is to be expected. Nevertheless, this year, the mortality from tuberculosis for that month was little more than one per cent. in excess of the average for the whole year 1924, and that average was the lowest ever recorded for any complete year. Second only in importance to tuberculosis is the remarkably low deathrate for the four epidemic diseases of childhood, measles, scarlet fever, whooping cough and diphtheria. Each shows a substantial decline over the record of a year ago and their combined deathrate is 40 per cent. lower than for February, 1924.

Although the mortality from influenza rose sharply as compared with January and was 25 per cent. higher than in February a year ago, the influenza situation is in no way alarming. The February deathrate was much lower than for the same month in 1923 and 1922, years in which influenza was more than usually prevalent although not in virulent form. Furthermore, when the influenza situation becomes really serious there is always an accompanying rise in the pneumonia deathrate. This year, mortality from pneumonia is substantially the same as for February a year ago.
